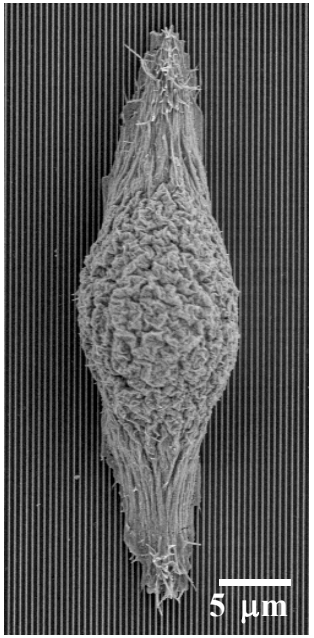
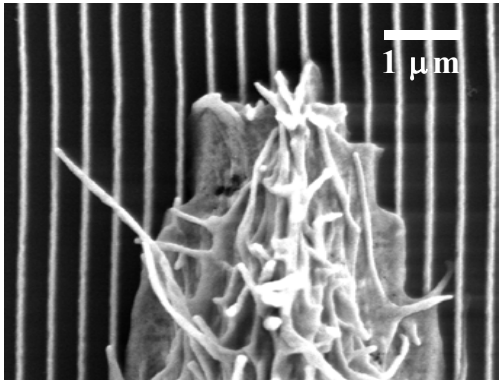
Biomimetic Substrate Topography Impacts Cell Behavior

Paul Nealey and Christopher Murphy

The basement membrane underlying the human corneal epithelium may be described as having features such as fibers, pores, And bumps with dimensions of 10 to 300 nm. The fundamental hypothesis of our research is that nanoscopic topography provides a set of cues or signals in addition to chemical cues to which the cells respond. We report intriguing new findings that demonstrate that the cells respond strongly to nanostructured substrates with features of biomimetic dimensions (length scales less than 200 nm) and that the response is different from that observed for cells cultured on substrates with larger features (length scales greater than 500 nm). Biomimetic substrate topography was shown to affect a number of important cellular behaviors, including cell orientation and spreading, focal adhesion formation, adhesion, differentiation and activation of G-proteins. These results are important for tissue engineering and the design of more *in vivo*-like cell culture systems.





Human Corneal Epithelial Cells (HCEC) responding to a nanostructured surface (70 nm wide ridges/400 nm period) *in vitro*. The surface is biomimetic in that the width of the ridges is commensurate with the dimensions of features present on the surface to which HCEC adhere *in vivo*. The cells extend different processes parallel and perpendicular to the substrate structure.

Continued Kit Development by the UW MRSEC Enables a Widespread Outreach Initiative That Brings Nanotechnology Concepts to K-12 Students

Wendy C. Crone

Alexandra Pozniak, a kindergartner at Madison Country Day School, may only just begin to grasp some of the basic concepts of material structure and behavior, but she can certainly appreciate the wonder in a tiny ball that can bounce very high inside a plastic tube when it strikes a base made of an amorphous metal.

The nanoscale education kits developed by the UW MRSEC have proven to be an effective and entertaining means of educating the general public as well as K-12 students about the importance of research into nanoscale science and engineering. Several of these kits have been adopted by various organizations involved in science education and outreach activities, including the Materials Research Society (MRS) Microworld Travelling Exhibit.

For more information about MRSEC kits and demonstrations, visit <http://www.mrsec.wisc.edu/nano/>.